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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,978	12/11/2003	Eko N. Onggosanusi	TI-36617	8537

23494 7590 08/24/2006

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EXAMINER	
MILORD, MARCEAU	
ART UNIT	**PAPER NUMBER**
2618	

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/732,978	Applicant(s) ONGGOSANUSI ET AL.	
	Examiner Marceau Milord	Art Unit 2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19,23-26,31 and 32* is/are rejected.

7)☒ Claim(s) *20-22 and 27-30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 8-19, 23-26, 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holtzman et al (US Patent No 640476 B1) in view of Aazhang et al (US Patent No 6529495 B1) and Lim et al (US Patent No 6240999 B1).

Regarding claims 1-4, 8, 12-13, 19, Holtzman et al discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers comprising: derotating the received signal (col. 3, lines 11-28; col. 7, lines 31-58); extracting information transmitted by the desired user from the received signal (col. 7, lines 42-60; col. 8, line 33-64; col. 9, lines 15-46).

However, Holtzman et al does not specifically disclose the steps of determining channel estimates and detecting the presence of interferers; computing contribution of the transmitted symbols from the user; removing the computed contribution from the received signal; and the

method further comprising, recomputing the transmitted symbols from the desired user; sampling the received signal at a given sampling rate; wherein the received signal is transmitted at a symbol rate, and wherein the sampling rate is essentially equal to the symbol rate; wherein the received signal is transmitted at a symbol rate, and wherein the sampling rate is higher than the symbol rate.

Aazhang et al, on the other hand, discloses a multistage detector that maximizes computation power while minimizing system delay. The differencing multistage detector receives signals from a plurality of users in a cell of a communications system and reduces the effect of multiple access interference to a signal from a desired user caused by interference from other users in the cell. The differencing multistage detector includes a plurality of stages, each stage including an interference canceller for removing intra-cell interference caused by the other users in the cell and producing an estimation output vector, wherein except for a first stage, the estimation output vector of a current stage is based on both a decision of the interference canceller of the current stage and the output from an interference canceller of a previous stage. The estimation output vector of a current stage is produced by combining the output from an interference canceller of a previous stage and the decision of the interference canceller of the current stage (col. 4, lines 4-27). Furthermore, the estimation output vector of a current stage is produced by subtracting the output from an interference canceller of a previous stage from the decision of the interference canceller of the current stage (col. 4, lines 30-39; col. 9, line 30- col. 10, line 33).

Lim et al also discloses a method for receiving a code-division multiple-access signal combining symbol values spread by a plurality of spreading codes, which method comprises the

steps of: converting the CDMA signal to a baseband signal; recognizing symbol boundaries in every multipath for every user in the baseband signal to produce a delay estimate; estimating an attenuation and phase rotation impressed on the signal by each multipath to produce channel estimates; generating new symbol estimates for every user at a sampling rate that is greater than a symbol rate of the signal; generating an estimate of the received signal using said symbol estimates and channel estimates; comparing the received signal with its estimate and feeding estimation error back to a means for estimating the transmitted symbols; sampling the symbol estimates at the estimated symbol boundaries of each user to obtain final symbol estimates (col. 4,lines 1-50; col. 8, line 34- col. 9, line 39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Lim Aazhang to the modified system of Aazhang and Holtzman in order to provide a multistage detector that maximizes computation power while minimizing system delay.

Regarding claim 9, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein the first computing comprises applying a channel estimate for the user to the received signal (col. 7, lines 22-55).

Regarding claim 10, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein an equalizer is used to apply the channel estimate to the received signal (col. 7, line 42- col. 8, line 23).

Regarding claim 11, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received

signal in the presence of interferers, wherein the second computing comprises multiplying the computed transmitted symbols with a channel estimate for the user (col. 7, line 42- col. 8, line 39).

Regarding claim 14, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein ordering of the users is performed (col. 5, lines 33-65; col. 6, lines 21-47).

Regarding claim 15, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein the ordering is based on a numbering of the users (col. 5, lines 33-65; col. 6, lines 21-47).

Regarding claim 16, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein the ordering is based on the users' channel energy (col. 5, lines 33-65; col. 6, lines 21-47).

Regarding claim 17, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein the ordering is based on SIR (col. 9, lines 15-46).

Regarding claim 18, Holtzman et al as modified discloses a method for extracting information (figs. 4-5) transmitted by a desired user in a communications system from a received signal in the presence of interferers, wherein the ordering is based on SINR (col. 9, lines 15-46).

Regarding claims 23-26, 31-32, Holtzman et al discloses a receiver (figs. 4-5) comprising: a channel estimation unit containing circuitry to determine a number of users present in the received signal and to compute channel estimates for each user (col. 3, lines 11-28; col. 7, lines 31-58; col. 7, lines 42-60; col. 8, line 33-64; col. 9, lines 15-46).

However, Holtzman et al does not specifically disclose the features of a multi-user detection unit coupled to the channel estimation unit, a sampling unit coupled to a signal input, the sampling unit containing circuitry to sample a received signal provided by the signal input at a specified sampling rate; wherein the multi-user detection unit can extract the information transmitted by the desired user in a single iteration.

Aazhang et al, on the other hand, discloses a multistage detector that maximizes computation power while minimizing system delay. The differencing multistage detector receives signals from a plurality of users in a cell of a communications system and reduces the effect of multiple access interference to a signal from a desired user caused by interference from other users in the cell. The differencing multistage detector includes a plurality of stages, each stage including an interference canceller for removing intra-cell interference caused by the other users in the cell and producing an estimation output vector, wherein except for a first stage, the estimation output vector of a current stage is based on both a decision of the interference canceller of the current stage and the output from an interference canceller of a previous stage. The estimation output vector of a current stage is produced by combining the output from an interference canceller of a previous stage and the decision of the interference canceller of the current stage (col. 4, lines 4-27). Furthermore, the estimation output vector of a current stage is produced by subtracting the output from an interference canceller of a previous stage from the

decision of the interference canceller of the current stage (col. 4, lines 30-39; col. 9, line 30- col. 10, line 33).

Lim et al also discloses a method for receiving a code-division multiple-access signal combining symbol values spread by a plurality of spreading codes, which method comprises the steps of: converting the CDMA signal to a baseband signal; recognizing symbol boundaries in every multipath for every user in the baseband signal to produce a delay estimate; estimating an attenuation and phase rotation impressed on the signal by each multipath to produce channel estimates; generating new symbol estimates for every user at a sampling rate that is greater than a symbol rate of the signal; generating an estimate of the received signal using said symbol estimates and channel estimates; comparing the received signal with its estimate and feeding estimation error back to a means for estimating the transmitted symbols; sampling the symbol estimates at the estimated symbol boundaries of each user to obtain final symbol estimates (col. 4,lines 1-50; col. 8, line 34- col. 9, line 39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Lim Aazhang to the modified system of Aazhang and Holtzman in order to provide a multistage detector that maximizes computation power while minimizing system delay.

3. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holtzman et al (US Patent No 640476 B1) in view of Aazhang et al (US Patent No 6529495 B1) and Lim et al (US Patent No 6240999 B1) as applied to claims 1-4 above, and further in view of Love (US Patent No 5818876).

Regarding claims 5-7, Lim, Aazhang and Holtzman disclose everything claimed as explained above except the steps of generating a list of hypotheses; computing an error variance

for each hypothesis in the list of hypotheses; selecting a hypothesis associated with a smallest computed error variance; and computing channel estimates from the selected hypothesis; wherein a hypothesis contains information about a desired user and any expected interferers.

However, Love discloses a method for updating an estimated channel impulse response of a maximum likelihood sequence estimator within a radio receiver. The method includes the steps of computing a rate of change of a channel impulse response from a current estimated channel impulse response and a previous estimated channel impulse response, selecting an update step size as a function of the rate of change of the estimated channel impulse response, and updating the estimated channel impulse response of the maximum likelihood sequence

estimator based upon the selected step size (col. col. 2, lines 20-31; col. 3,line 455- col. 4, line 50). Furthermore, a maximum likelihood sequence estimation hypothesis is then determined using the calculated synchronization point and initial channel response values. Determination of the hypothesis with the lowest BER is as above wherein the AMLSE switch control selects hypothesis with the lowest level of mean square error (col. 5, lines 42-67;col. 6, lines 18-50). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Love Lim Aazhang to the modified system of Lim, Aazhang and Holtzman in order to improve the stability and convergence of maximum likelihood sequence estimators by determining an update step size based upon channel parameters.

Allowable Subject Matter

4. Claims 20-22, 27-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marceau Milord whose telephone number is 571-272-7853. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew D. Anderson can be reached on 571-272-4177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MARCEAU MILORD

Marceau Milord

Primary Examiner

Art Unit 2618

M Milord

MARCEAU MILORD
PRIMARY EXAMINER

8-15-06